July 20, 1943. J. E. BRULOTTE 2,324,760

PIPE FORMER AND LAYER

Filed May 28, 1942 5 Sheets-Sheet 1

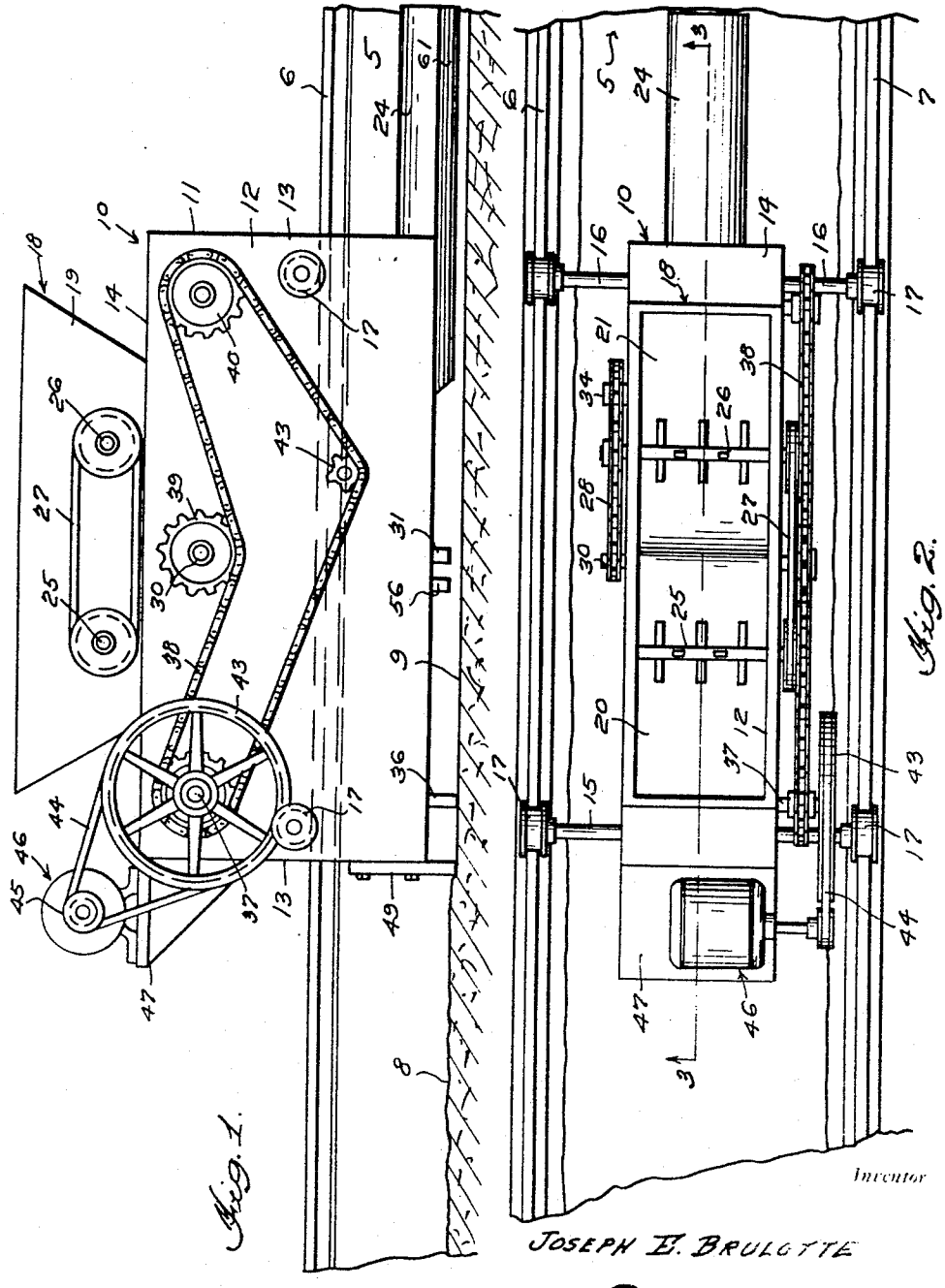


Fig. 1.

Fig. 2.

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PIPE FORMER AND LAYER

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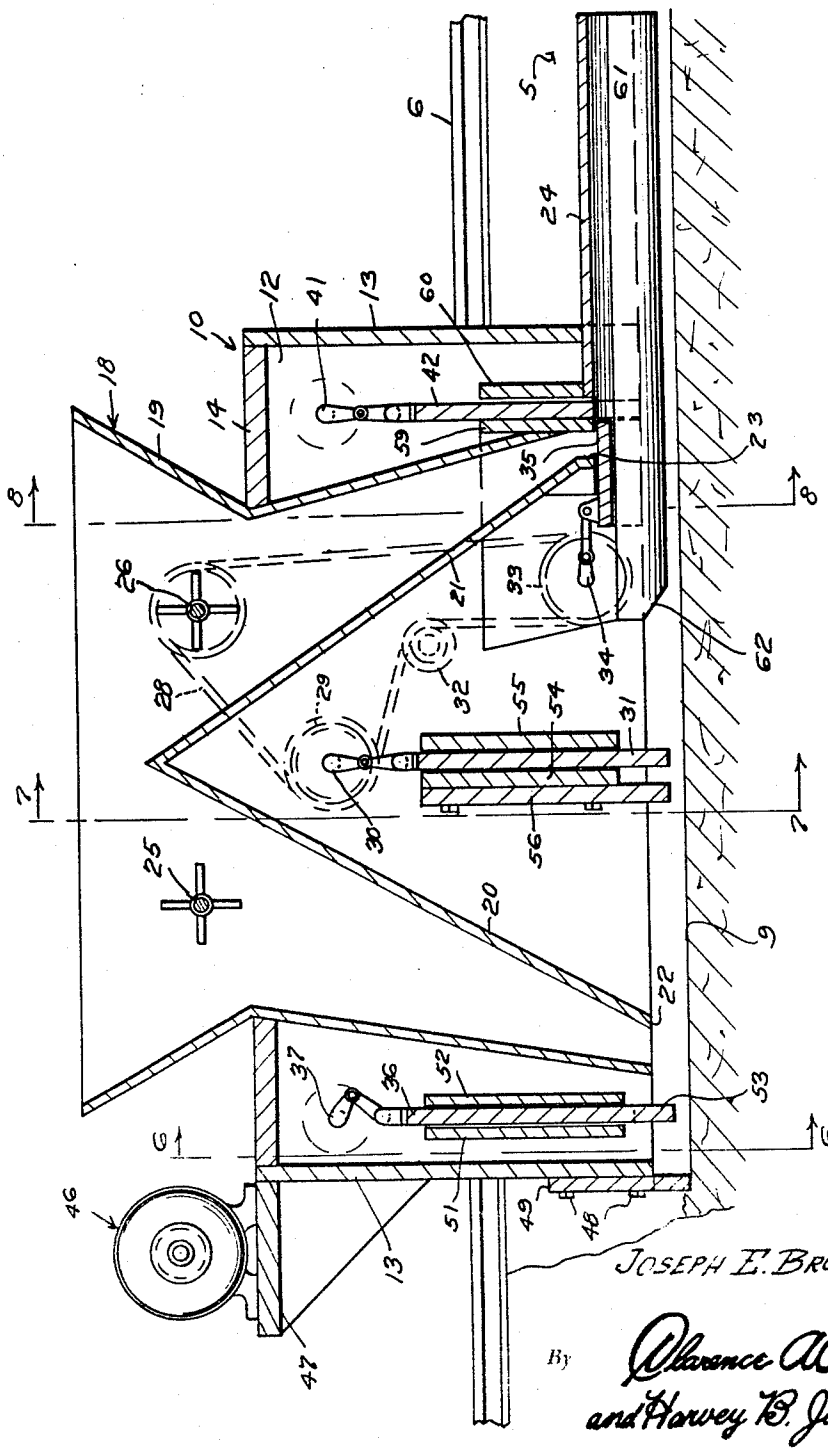


Fig. 3.

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PIPE FORMER AND LAYER

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Fig. 6.

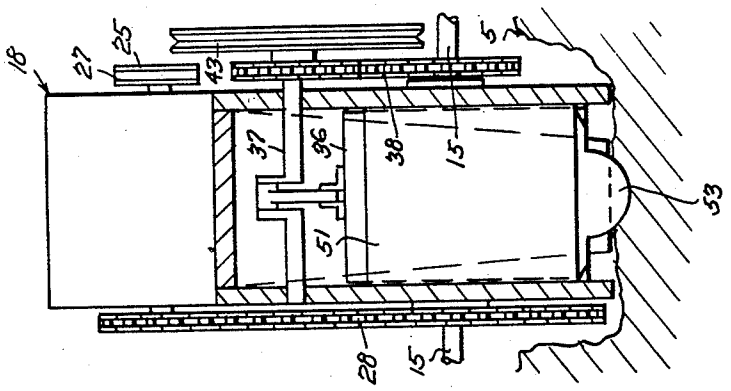


Fig. 5.

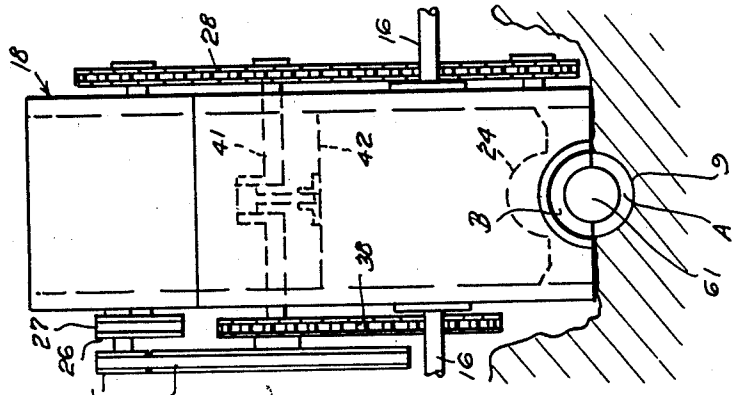
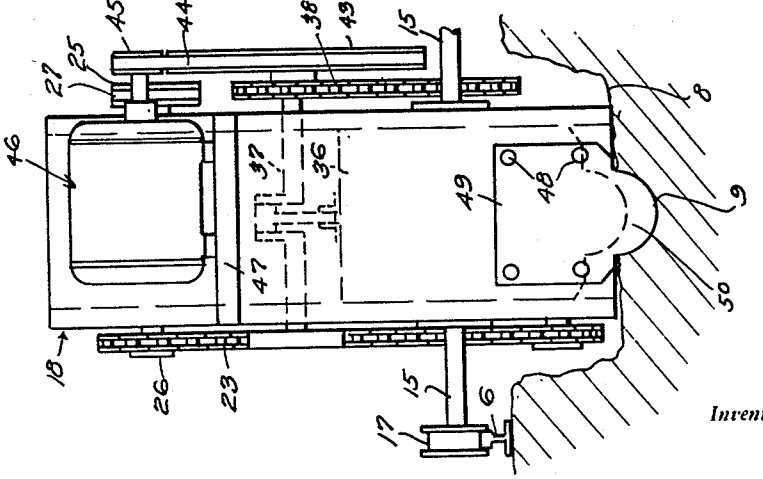


Fig. 4.



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PIPE FORMER AND LAYER

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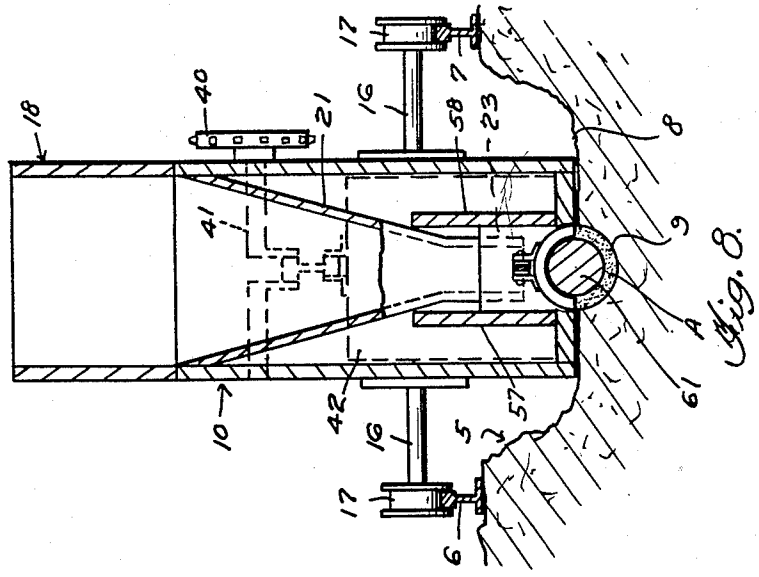


Fig. 8.

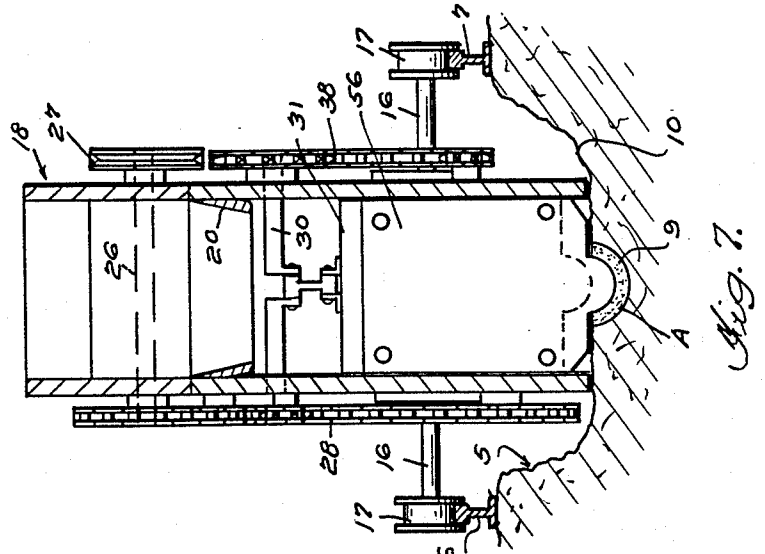


Fig. 7.

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PIPE FORMER AND LAYER

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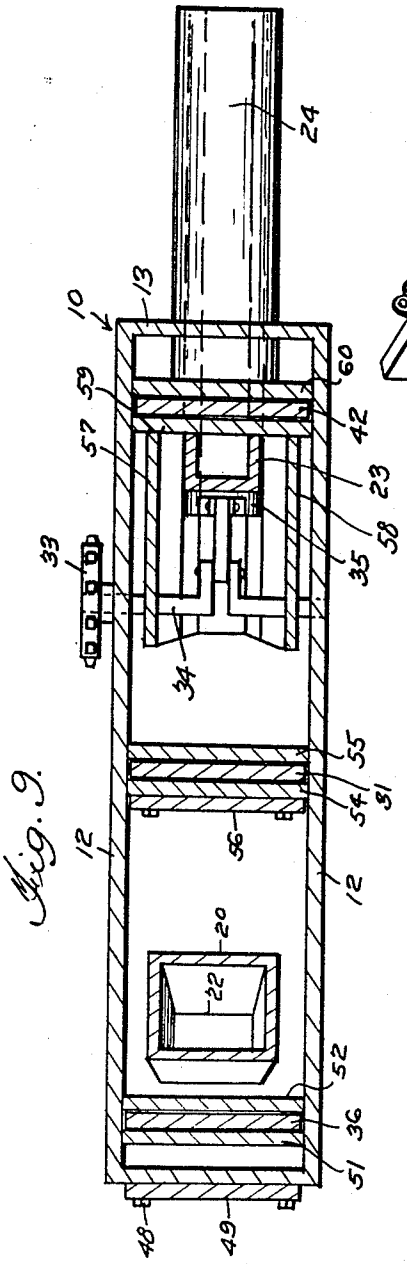


Fig. 9.

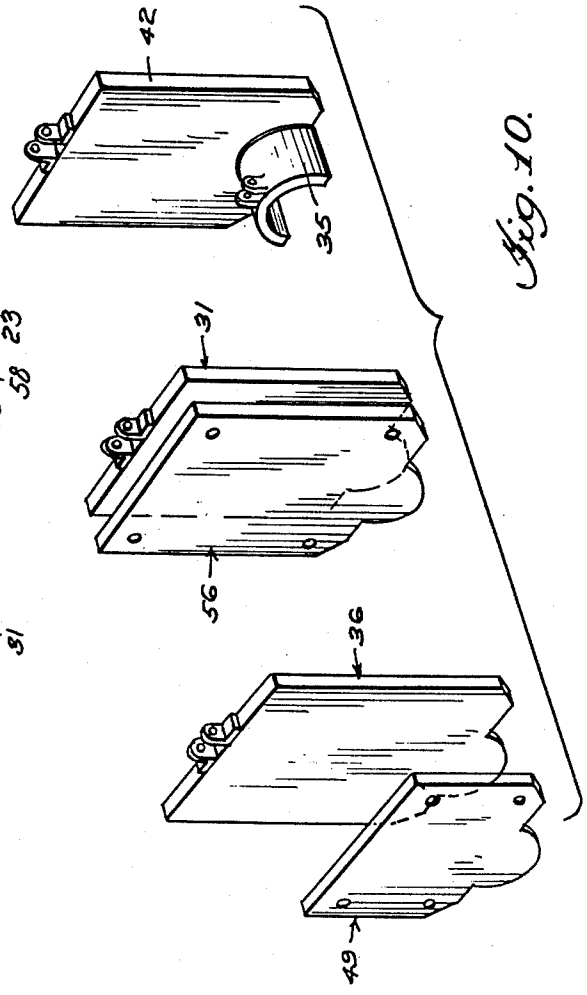


Fig. 10.

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Patented July 20, 1943 2,324,760

UNITED STATES PATENT OFFICE

2,324,760

PIPE FORMER AND LAYER

Joseph E. Brulotte, Yakima, Wash.

Application May 28, 1942, Serial No. 444,931

3 Claims. (Cl. 25—32)

The invention relates to improvements in machines for forming and laying continuous concrete or similar material pipe, the primary object of the invention being to provide a self-propelled machine of this character which in operation forms a mold in the floor of the ditch or the like in which the pipe is being formed and laid as the mold for the lower half or section of the pipe, whereby the lower section of the pipe is automatically and immediately laid in a perfectly conforming earth cradle, and wherein the upper half or section of the pipe is formed and pressed onto the lower section at a point behind the point at which the lower section is formed, whereby the sections are firmly united and produce a pipe which is firmly laid in a cradle in the earth.

Another important object of the invention is to provide a simple and efficient machine of the character indicated above which is relatively simple and inexpensive to construct and operate, and which requires no special operating skill.

Other important objects and advantages of the invention will be apparent from a reading of the following description taken in connection with the appended drawings, wherein for purposes of illustration a preferred embodiment of the invention is shown.

In the drawings:

Figure 1 is a general side elevational view of a machine constructed in accordance with the present invention, showing the same operatively located with respect to a ditch or trench in which the pipe is to be laid.

Figure 2 is a top plan view of Figure 1.

Figure 3 is an enlarged longitudinal vertical sectional view taken through Figure 2 along the line 3—3 and looking in the direction of the arrow.

Figure 4 is a front end elevational view of Figure 1.

Figure 5 is a rear end elevational view of Figure 1.

Figure 6 is a transverse vertical sectional view taken through Figure 3 along the line 6—6 and looking in the direction of the arrows.

Figure 7 is a transverse vertical sectional view taken through Figure 3 along the line 7—7 and looking in the direction of the arrows.

Figure 8 is a transverse vertical sectional view taken through Figure 3 along the line 8—8 and looking in the direction of the arrows.

Figure 9 is a general horizontal sectional view taken through the lower part of Figure 3.

Figure 10 is a group perspective view of the formers and tamps in the successive positions they occupy in the machine.

Referring in detail to the drawings, the numeral 5 generally designates a trench or ditch in which the continuous pipe is to be laid, rails 6 and 7 being mounted on the banks of the ditch or on the ground level or surface on opposite sides of the ditch and substantially parallel with the bottom 8 of the ditch and the substantially semi-circular cradle 9 which is formed by the passage of the machine along the ditch, and in which is conformably seated the lower half of the pipe during its formation by the machine. By reason of these provisions, the cradle 9 is accurately and uniformly formed and leveled in the ditch so as to provide a uniform and regular cradle and support for the lower section of the pipe and thereby greatly increase the uniformity and serviceability of the installation.

The machine which is generally designated by the numeral 10 comprises a longitudinally and vertically elongated casing 11 comprising laterally spaced side walls 12, vertical end walls 13 and a horizontal top 14, with front and rear pairs of axles 15 and 16, respectively, having grooved wheels 17 riding on the heads of the rails 6 and 7. The shafts 15 and 16 are mounted to the casing 10 at such elevation that the machine reaches sufficiently into the ditch 5, the arrangement of the shafts 15 and 16 being devised so that the machine will operate properly in a ditch of a specified depth, it being obvious that provisions for adjusting the axles 15 and 16 vertically to accommodate ditches of different depths, can be provided without invention.

A fluid concrete hopper 18 has a funnel portion 19 projecting above the top 14 of the casing 10 as particularly well shown in Figure 3 of the drawings, and downwardly and forwardly and downwardly and rearwardly directed tapering portions 20 and 21, respectively. The portion 20 terminates in a nozzle 22 at a proper elevation above the crade or groove 9 which is formed by the machine in the bottom of the ditch to deposit the fluid concrete for the formation of the lower section of the pipe. The rear tapered hopper portion 21 terminates in a nozzle 23 arranged on a level with the upper transversely curved wall 24 which extends rearwardly from the casing 10 from the point just forwardly of the rear end wall 13 as shown in Figure 3 of the drawings.

Horizontal rotary paddles 25 and 26 are located in the upper part of the hopper portions 20 and 21, respectively, on a level above the top 14 of the casing 10 and their shafts extend across the fun-

nel portion 19 of the hopper and then through the right hand side thereof as indicated in Figures 1 and 2 where they are provided with pulleys connected together by a belt 27. The shaft of the agitator 26 extends through the opposite side wall of the hopper portion 19 where it is provided with a sprocket over which is trained a sprocket chain 28 which is also trained over a sprocket wheel 29 on the crankshaft 30 which operates the vertically reciprocable tamp 31. The sprocket chain 28 is also trained over an idler sprocket 32 which is mounted on a stub shaft on the left hand side of the casing 10, and also over a sprocket 33 on a crankshaft 34 which is mounted across the lower part of the casing 10 and operates the horizontally reciprocable smoother 35.

A forward tamp 36 which is vertically reciprocable is mounted between the hopper portion 20 and the front wall 13 of the casing 10 as shown in Figure 3 of the drawings and is operatively connected to a crankshaft 37 which has a sprocket wheel over which a sprocket chain 38 is trained. The sprocket chain 38 is also trained under a sprocket wheel 39 on the crankshaft 30 and over a sprocket 40 on a crankshaft 41 which is operatively connected to the rear tamp 42, the latter being located between the rear hopper portion 21 and the rear end wall 13 of the casing 10 as shown in Figure 3 of the drawings. The lower flight of the sprocket chain 38 is trained under an idler sprocket 43 which is mounted on a stub shaft on the right hand side of the casing 10 as shown in Figure 1 of the drawings. The crankshaft 37 has on its right hand end, a relatively large combination flywheel and sprocket pulley 43 over which a belt 44 is trained, the belt being also trained over the pulley 45 on a suitable motor 46, here shown as an electric motor, without limitation to such form of motor, which is mounted on a platform 47 projecting forwardly on a level with the top of the front of the casing 10.

Bolted or otherwise secured to the lower part of the front wall 13 of the casing 10 is the cradle former plate 49 which has a depending semi-circular extremity 50 of substantially the desired cross section of the cradle 9, which depends sufficiently below the lower end of the casing 10 to cut and scrape the desired cross section of the cradle 9 in the bottom 8 of the trench or ditch 5 as the machine proceeds forwardly. The forward tamp 36 comprises a vertically reciprocable plate working between forward and rearward guide plates 51 and 52 mounted on the casing 10, the lower end of the tamp being substantially the same shape as the lower end of the plate 49, so that the sides of the cradle 9 are conformably tamped by the lower end of the tamp 36 as the machine proceeds, so that the cradle is well tamped and shaped before the fluid concrete coming down the front chute 20 of the hopper 18 flows into place in the said cradle.

The intermediate tamp 31 works between guides 54 and 55, likewise mounted on the casing 10, the lower extremity of the tamp 31 being formed to the size and shape of the interior shape and dimensions of the pipe being laid. The downward extreme position of the tamp 31 is limited to provide for the desired wall thickness of the pipe, the space between the bottom of the cradle 9 and the extreme low position of the tamp 31 determining the wall thickness. Mounted on the forward guide 54 is a concrete spreader and scraper 56 which has its lower part shaped to scrape and distribute the concrete laid from the nozzle 22 in the cradle to the approximate shape of the interior of the lower section of the pipe. The tamp 31 immediately following the scraper 56 tamps the inner surface of the lower pipe section to shape.

As indicated in Figure 8 of the drawings, the rear hopper section 21 has downwardly tapering walls which terminate in the nozzle 23 already alluded to, the nozzle being located within confining longitudinal walls 57 and 58 which are sufficiently spaced to be just on opposite sides of the pipe being formed. The rear end wall 59 across and between the walls 57 and 58 forms the front guide for the rear tamp 42 in conjunction with the guide 60. The latter rests on the top of the curved cross section former 24, while the guide 59 terminates at its lower end in a semi-circular notch the same size as the outside dimension and curvature of the upper section of the pipe and is stationarily fixed to be matched to the inside contour of the former 24.

The smoother and pusher 35 is mounted in relatively close conformity to the upper side of the internal former 61 which is mounted stationarily to the lower part of the rear portion of the casing 10 and has its lower end angularly undercut as indicated by the numeral 62 to avoid digging into the as yet soft concrete of the formed lower pipe section. As indicated in Figure 8 of the drawings, the internal former 61 is cylindrical in cross section and has substantially the same diameter as the inside diameter of the completed pipe. The cylindrical internal former 61 is supported a distance equal to the wall thickness of the pipe above the cradle 9 and is spaced at a similar distance from the semi-circular upper former 24, the horizontally reciprocable smoother and pusher 35 being of about the same thickness as the thickness of the wall of the completed pipe.

The pusher 35 in its extreme rearward position illustrated in Figure 3 of the drawings closes off the lower end of the nozzle 23 so as to prevent concrete from reaching the region to form the upper pipe section, the rear tamp 42 being at this stage of operation in its extreme elevated position so that the concrete deposited by the nozzle 23 pushed rearwardly by the pusher 35 can pass the tamp 42 and enter the space between the upper former 24 and the internal former 61. The tamp 42 is so arranged that it never subsides below this described position. It is arranged to be vertically reciprocated many times faster than the reciprocation of the pusher 35, so as to apply several tamping and forming blows to the deposit of concrete as it is pushed rearwardly by the pusher 35. In the forward position the pusher 35 is withdrawn as a closure for the nozzle 23, so that the concrete can flow onto the internal former 61 and reach the upper edges of the walls of the already formed lower pipe section. Due to the rearward pushing action of the pusher 35, the accumulation of concrete in the act of forming the upper section of the pipe upon the lower section forms an abutment against which the pusher 35 works, so as to feed the machine as a whole forwardly as the gradual completion of the pipe takes place. It will be understood that the lower end of the tamp 42 is cut out semi-circularly in appropriate diameter to provide the desired tamping and shaping action upon the concrete pushed rearwardly by the pusher 35 into the space between the upper former 34 and the internal former 61. It will also be observed that the transit of the internal former 61 with the already laid and shaped lower section will result

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in final perfection of the lower pipe section and more firm seating thereof in the cradle 9, while at the same time producing the required formation of the upper section in cooperation with the upper former 24, whereby the upper and lower pipe sections are perfectly matched and mated and forced together to form a monolithic continuous pipe appearing at the lower end of the internal former 61 as the machine progresses along the ditch.

As will now be seen, the machine is driven forwardly, i. e., to the left, as viewed in Figures 1, 2 and 3, on the rails 6 and 7, by impact of the reciprocating smoother and pusher 35 against the concrete laid in between the upper former 24 and internal former 61. In its forward motion with the machine, the cradle former plate 49 digs the cradle 9 in the longitudinal center of the trench, or ditch, 5, and the reciprocating forward tamp 36 packs and shapes the cradle 9 progressively. The front hopper portion 20 feeds concrete out of the nozzle 22 into the cradle 9 progressively, the concrete thus fed is shaped progressively by the spreader and scraper 56 to form the lower pipe section internally, and the thus shaped lower pipe section is immediately tamped by the reciprocating internal tamp 31. Immediately following the last operation, the internal former 61 in its forward travel uniformly shapes the lower pipe section internally, while at the same time concrete is fed from the rear hopper section 21 through the nozzle 35 onto the internal former 61 to be tamped by the smoother and pusher plate 35 in between said former 61 and the upper former 24 to progressively form therewith the upper section of the pipe. The manner in which the paddles 25, 26 and the tamps 36, 31, 42, together with the smoother and pusher plate 35, are driven has already been set forth.

Although there is shown and described herein a preferred embodiment of the invention, it is to be definitely understood that I do not desire to limit the application of the invention thereto, except as may be required by the scope of the subjoined claims.

Having described the invention, what is claimed as new is:

1. A machine for forming a cradle in the floor of a ditch and forming and laying a continuous concrete pipe in the cradle formed of upper and lower sections, said machine comprising a casing to depend into the ditch, means supporting the casing from the surface of the ground for movement along the ditch, a digger depending from the forepart of the casing to produce a semicircular cradle in the floor of the ditch, a forward vertically reciprocating tamp for shaping and compacting the cradle, a fluid concrete hopper having a forward nozzle discharging into said cradle to the rear of said forward tamp, an intermediate vertically reciprocable tamp to the rear of said forward nozzle, a shaper located in front of said intermediate tamp to roughly shape the laid concrete in the cradle to the internal contour of the lower pipe section, said intermediate tamp operating to compact the internal contour of the lower pipe section, power means operating said tamps, and upper section forming means on said casing to the rear of said intermediate tamp.

2. A machine according to claim 1 wherein said upper section forming means comprises a cylindrical internal former mounted on said casing and concentrically spaced from the cradle at a distance approximately the wall thickness of the lower pipe section, a horizontally reciprocable semicylindrical smoother and pusher concentrically spaced above the forward part of said cylindrical former, a rear vertically reciprocable tamp located to the rear of the rearmost position of said pusher, a rear nozzle on said hopper closed by said pusher in its extreme rearward position and uncovered by said pusher in a forward position to deposit concrete on the upper surface of said cylindrical former, an upper pipe section former concentrically spaced from the top of said cylindrical former to the rear of said rear tamp at a distance approximately equalling the wall thickness of the upper pipe section, said pusher being arranged to push concrete between the cylindrical former and said upper pipe section former to define the upper pipe section and to abut the edges of the upper pipe section with the edges of the lower pipe section to produce a seamless pipe, said power means coordinately operating said pusher and said rearward tamp coordinately with the forward and intermediate tamps.

3. A machine according to claim 1 wherein said upper section forming means comprises a cylindrical internal former mounted on said casing and concentrically spaced from the cradle at a distance approximately the wall thickness of the lower pipe section, a horizontally reciprocable semicylindrical smoother and pusher concentrically spaced above the forward part of said cylindrical former, a rear vertically reciprocable tamp located to the rear of the rearmost position of said pusher, a rear nozzle on said hopper closed by said pusher in its extreme rearward position and uncovered by said pusher in a forward position to deposit concrete on the upper surface of said cylindrical former, an upper pipe section former concentrically spaced from the top of said cylindrical former to the rear of said rear tamp at a distance approximately equalling the wall thickness of the upper pipe section, said pusher being arranged to push concrete between the cylindrical former and said upper pipe section former to define the upper pipe section and to abut the edges of the upper pipe section with the edges of the lower pipe section to produce a seamless pipe, said power means coordinately operating said pusher and said rearward tamp coordinately with the forward and intermediate tamps, said pusher being arranged to move rearward against the formed upper pipe section so as to push the casing forwardly along the ditch to leave the formed pipe in place in the cradle.

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